

Forest Insect Conditions
**MALHEUR NATIONAL FOREST
and ADJACENT TIMBERLANDS**
1946 - 1957

Walter J. Buckhorn

PACIFIC NORTHWEST FOREST & RANGE EXPERIMENT STATION
R.W. COWLIN DIRECTOR
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

PORTLAND, OREGON



JULY 1957

SUMMARY

The results of two types of cooperative forest-insect surveys on the Malheur National Forest and adjacent timberlands are reported: (1) Pine beetle check-plot surveys since 1946 and (2) general aerial and ground surveys since 1947.

Check-plot losses caused by the western pine beetle averaged 52 board-feet per acre per year and ranged from 35 to 74 board-feet per acre per year from 1946 to 1955. Since 1952 the general trend of ponderosa pine mortality has been downward. However, indications are that a slight increase may occur in 1957 as a result of slightly higher beetle populations in the fall of 1956. Of the 9 half-section pine beetle check plots cruised in 1946, only 4 remained in 1956.

Damage to pine and fir stands caused by four other bark beetles--Douglas-fir beetle, fir engraver, Oregon pine ips, and mountain pine beetle--are discussed. In 1956, losses caused by the Oregon pine ips and mountain pine beetle increased over the levels of previous years. No significant damage by the Douglas-fir beetle or fir engraver was observed in 1956.

Spruce budworm damage increased steadily from 1947 through 1952. Aerial spraying operations, after being postponed in 1953 and 1954, were successfully conducted on 233,764 acres in 1955. The treated stands remained free of budworm damage in 1956 while infestations on unsprayed units increased to 228,980 acres. No spraying was conducted in 1956 and none will be undertaken in 1957. The need for spraying in 1958 will be determined through surveys and studies in 1957.

FOREST INSECT CONDITIONS
MALHEUR NATIONAL FOREST AND ADJACENT TIMBERLANDS

1946 - 1956

by

Walter J. Buckhorn

Division of Forest Insect Research

July 1957

PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION
R. W. Cowlin, Director Portland, Oregon
FOREST SERVICE U. S. DEPARTMENT OF AGRICULTURE

Preface

Forest insect surveys of timberlands within and adjacent to the Malheur National Forest have been cooperative undertakings and have been of two types. Ground surveys have been made by three-man crews of the U.S. Forest Service and the former Bureau of Entomology and Plant Quarantine. Aerial surveys have used planes and personnel of the Oregon State Board of Forestry, the Forest Service, and the Bureau. Reports of survey findings have been prepared by the Bureau and by the Division of Forest Insect Research of the Pacific Northwest Forest & Range Experiment Station.

Acknowledgment is made to the organizations and to the many individuals who have contributed to the forest insect surveys herein reported.

CONTENTS

	Page
INTRODUCTION	1
SURVEY METHODS	1
Check-Plot Surveys.	1
Aerial Surveys.	2
MORTALITY TREND ON PINE BEETLE CHECK PLOTS, 1946-55. . .	2
Check-Plot Losses	2
GENERAL FOREST INSECT CONDITIONS, 1947-56.	4
Spruce Budworm	4
Douglas-fir Beetle	4
Fir Engraver	5
Mountain Pine Beetle	5
Oregon Pine Ips	5
Western Pine Beetle	5
RECOMMENDATIONS	5

APPENDIX

Table 1. Insect-caused losses (gross) on individual check plots in old-growth ponderosa pine, Malheur National Forest and adjacent timberlands, 1946-55	7
Table 2. Insect-caused losses (gross) for all check plots in old-growth ponderosa pine, Malheur National Forest and adjacent timberlands, 1946-55	11
Table 3. Spruce budworm infestation on and adjacent to the Malheur National Forest, 1947-56.	11
Table 4. Insect damage, by other than spruce budworm, on and adjacent to the Malheur National Forest, 1952-56	12

INTRODUCTION

Systematic ground surveys on representative 320-acre check plots were started in the fall of 1931 to measure losses caused by an epidemic of the western pine beetle (Dendroctonus brevicomis Lec.) in virgin stands of ponderosa pine within and adjacent to the Malheur National Forest. Although the number of check plots has varied from 2 in 1931 to 16 in 1937 and 5 in 1956, the recorded data have been useful in following the trends of bark beetle-caused losses in ponderosa pine.

Aerial surveys were begun in 1947 to map and evaluate an epidemic of the spruce budworm (Choristoneura fumiferana (Clem.)), which had appeared in fir stands on the northern part of the forest. After 1947, the aerial surveys were expanded to include detection and appraisal of damage by other forest insects.

The purpose of this report is: (1) To summarize the results of the ground surveys that were last reported in 1947 ^{1/}, (2) to review the spruce budworm situation since 1947, and (3) to review general bark beetle conditions during the period 1952-56.

SURVEY METHODS

Check-Plot Surveys

Check-plot surveys are based on four 1-mile-long lines 10 chains apart through representative 320-acre virgin pine plots. The operation is conducted by a 3-man crew consisting of a compassman and two spotters. All ponderosa pine killed since the previous survey are blazed, numbered, marked as to year of kill, and located on a section plat. Data recorded for each tree consists of: (1) Tree number, (2) insect responsible, (3) D.B.H., and (4) Keen tree class. Wind-thrown trees are recorded by diameter and year of fall. Volumes are computed from local volume tables.

At the time of cruise, only a portion of the current season's loss has developed sufficiently to detect and mark. The remainder of the loss is picked up on the following survey. Thus two cruises are necessary to complete the record of 1 year's loss.

^{1/} Buckhorn, Walter J. Pine beetle survey of 1946 on the Malheur National Forest. U. S. Bur. Ent. and Plant Quar. Office Report, 6 pp., illus. Feb. 1947.

Aerial Surveys

Prior to 1947 general appraisals of insect conditions were obtained by viewing stands from lookouts and other points of vantage. Then aerial surveys were begun and since that time insect activity has been observed from the air by a survey team consisting of a pilot and one or two observers.

In making an aerial survey, parallel strips 4 to 6 miles apart are flown over the forest, usually 800 to 1,500 feet above the terrain. All centers of epidemic infestations are sketched in place on 1/4-inch per mile planimetric maps of the forest. For each center of damage, the following is indicated on the map: (1) Insect responsible, (2) intensity of infestation, and (3) host species attacked. Most centers are checked on the ground to verify aerial findings. Special checks are made in centers of infestation where any doubt exists as to cause, host, etc. Upon completion of ground checking, a map is prepared to show all infestations. Copies of the final map are sent to the Region 6 Division of Timber Management and to the forest supervisor to aid in planning the timber management program. All survey data are incorporated in an annual report for the region. Copies of the report are sent to the forest supervisor, district rangers, and cooperators.

MORTALITY TREND ON PINE BEETLE CHECK PLOTS, 1946-55

The western pine beetle caused most of the ponderosa pine mortality recorded on the plots. The mountain pine beetle (Dendroctonus monticolae Hopk.), the California flatheaded borer (Melanophila californica Van. D.), the emerginate ips (Ips emarginatus Lec.), and the Oregon pine ips (Ips oregoni (Eichh.)), separately or in combination with the western pine beetle accounted for the remainder of insect-caused losses.

Check-Plot Losses

The trend of beetle-caused losses since the plots were established in 1931 is shown in figure 1. Since 1946, any trend evident in losses is due to chance variation and not to significant mean differences.

Table 1 (appendix) summarizes the losses on individual plots for the years 1946-55. During this 10-year period the Rudio Mountain plot suffered the heaviest loss, amounting to 612 board-feet per acre or 4.95 percent of the stand.

The average loss for all check plots decreased from 62 board-feet per acre in 1946 to a low of 35 board-feet per acre in 1948 (table 2). It then increased to 74 board-feet in 1950. The infestation fluctuated considerably during the next four years but by 1955 the loss had again decreased to 35 board-feet per acre. From partial plot records and aerial observations it appeared that the infestation increased slightly during the latter part of 1956.

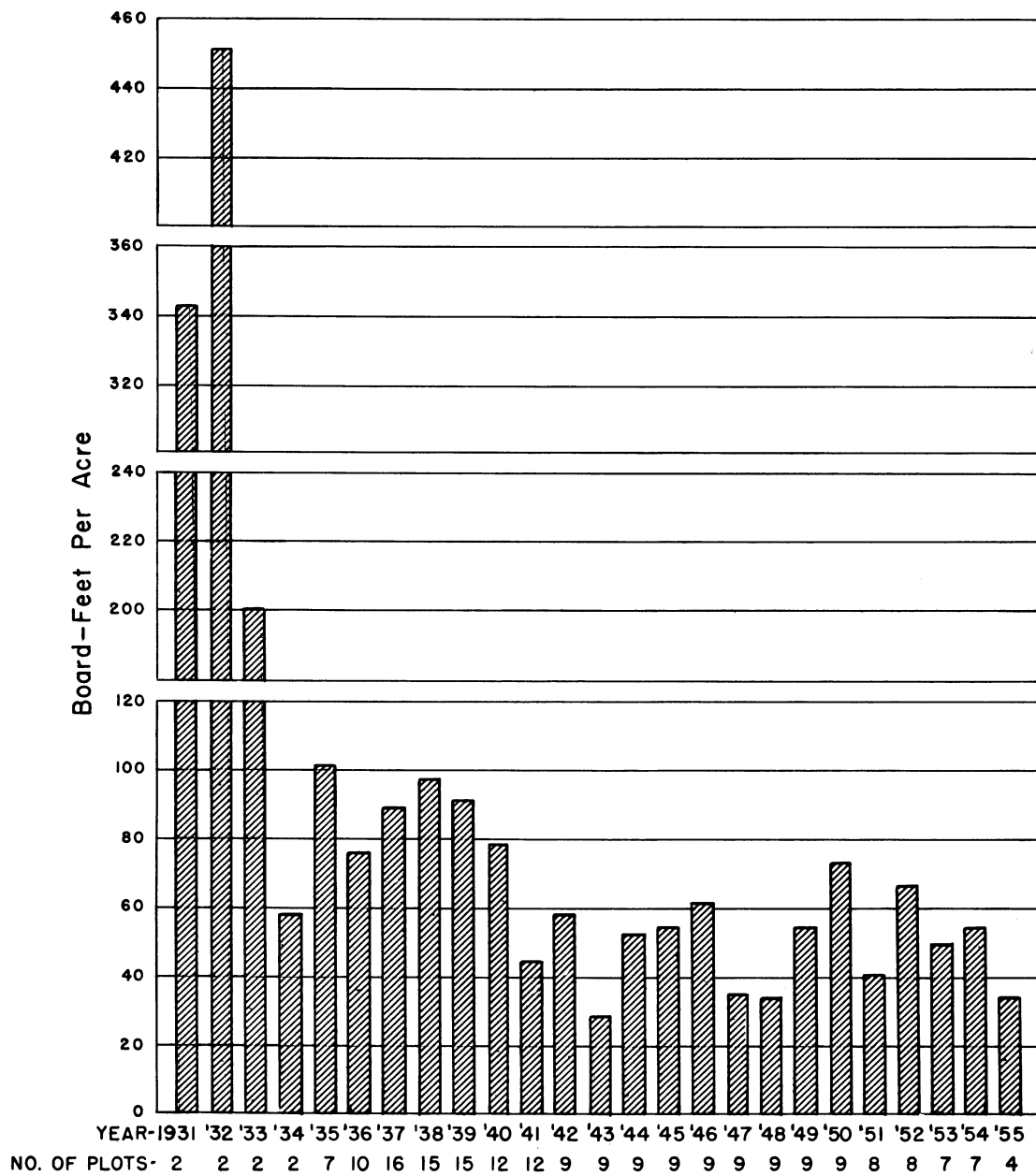


Figure 1.- Trend of ponderosa pine losses on check plots in Malheur National Forest and adjacent timber lands

GENERAL FOREST INSECT CONDITIONS, 1947-56

A record of spruce budworm damage on and adjacent to the Malheur N. F. from the first survey (1947) to 1956 is given in table 3. Damage by other insects during the period 1952-56 is given in table 4.

A brief discussion of recent insect conditions and the 1956 survey findings is as follows:

Spruce Budworm

On the first cooperative aerial survey in 1947, spruce budworm damage was recorded on 41,000 acres on the ridges around Fox Valley. By 1952 the infestation had expanded to 204,960 acres and had reached the stage where direct control measures were needed. The budworm had invaded all fir stands on the northern end of the forest and had appeared in a small spot in the extensive fir stands on the north side of Aldrich Mountain. The Northwest Forest Pest Action Council recommended aerial spraying operations for 1953 and again for 1954. Because of a shortage of federal funds, control was postponed until 1955 when 233,764 acres of epidemic infestations were successfully treated. On the unsprayed units, the infestation continued to expand and new centers were discovered on Snow Mountain, Gold Hill, and Strawberry Mountain. In 1955, a total of 64,730 acres of damage was recorded. The sprayed units remained free of budworm in 1956 while on the unsprayed units the infestation increased to 228,980 acres. The Aldrich Mountain infestation expanded to Flagtail Mountain on the south and to Canyon Creek on the east and the infestation on Strawberry Mountain extended into Logan Valley. A new center was detected on King Mountain, 30 miles south of the nearest infestation. Current damage is classed as 91.5 percent "light" and 8.5 percent "moderate" and is not severe enough to cause significant tree mortality.

No control was done in 1956 and none is planned for 1957. However, aerial spraying is tentatively planned for 1958, depending upon survey findings and the status of natural control factors in the fall of 1957.

Douglas-Fir Beetle

Outbreaks of the Douglas-fir beetle occurred over much of the Blue Mountains area during 1953, with 13 centers of damage covering 8,240 acres recorded on the forest. These centers were mostly in the drainages of the upper John Day River, lower Malheur River, and Canyon Creek. The outbreaks began to decline in 1954, and no centers were observed in 1956. No significant tree-killing by the beetle has occurred in budworm-weakened trees on the Malheur N. F.

Fir Engraver

Outbreaks of Scolytus ventralis Lec. in subalpine fir flared up in 1953 and again in 1955. Each outbreak subsided the year following detection. No damage was observed in 1956. No control is necessary against this beetle.

Mountain Pine Beetle

Killing of lodgepole pine by the mountain pine beetle increased each year from 1952 to 1954, declined in 1955, and increased again in 1956. In 1956, outbreaks were recorded on 5 centers totaling 5,600 acres. Four of these -- Wickiup, Little Bear Meadows, Lake Creek, and The Swamp -- were present in 1954. The fifth center developed on Big Creek just east of Lake Creek Guard Station. The past record of mountain pine beetle outbreaks shows that they usually continue until all available host material over 3 inches d.b.h. has been killed.

Oregon Pine Ips

Killing of young ponderosa pine by Ips oregoni has increased each year since 1954. In 1956 there were 36 centers of damage covering 13,120 acres. All but two of these centers were in stands surrounding the John Day Valley. Tree-killing was especially severe on the east slopes of Little Black Butte. No control is warranted; however, damage in residual stands can be reduced by (1) lopping and scattering limbs, thereby exposing main stem surfaces to drying by the sun, and (2) varying the time of felling and thinning.

Western Pine Beetle

Epidemic infestations of the western pine beetle, declined steadily from 68,670 acres in 1953 to only 960 acres in 1956. Although a slight increase in pine beetle activity is anticipated in 1957, damage is expected to remain at a low endemic level.

RECOMMENDATIONS

Cooperative forest insect surveys on and adjacent to the Malheur National Forest in 1956 have shown a low endemic level of bark beetle damage and a sharp increase in light epidemic spruce budworm defoliation. The following is recommended:

1. An appraisal of spruce budworm damage should be made in 1957 to determine if aerial spraying operations will be needed in 1958. Plans for this evaluation have been made.

2. High risk trees should be removed and dead and currently infested merchantable trees and windthrown trees should be promptly salvaged to reduce beetle populations and realize timber values.
3. Recruising of the remaining pine beetle check plots in virgin and selectively cutover stands should be continued.
4. Aerial surveys and ground checks of survey findings, as previously conducted, should be continued.

* * *

APPENDIX

Table 1.--Insect-caused losses (gross) on individual check plots in old-growth ponderosa pine, Malheur National Forest and adjacent timberlands, 1946-55

Area and plot	Year	Trees killed	Volume loss		
			Total	Per acre	Proportion of 1946 green stand
		Number	-Board-feet-		Percent
JOHN DAY AREA					
Long Creek					
(T10S, R28E	1946	18	16,310	51	0.56
Sec.24S1/2;	1947	9	8,020	25	.28
320a.; 2,907	1948	5	3,460	11	.12
M b.m. pon.	1949	56	29,820	93	1.03
pine, 1946)	1950	33	15,990	50	.55
	1951	36	18,860	59	.65
	1952	28	16,250	51	.56
	1953	16	7,250	23	.25
	1954	18	15,250	47	.52
Total		219	131,210	410	4.52
Average		24	14,580	46	0.50
Rudio Mountain					
(T11S, R28E,	1946	16	6,450	26	0.21
Sec. 26W1/2;	1947	15	3,560	15	.12
245a.; 3,032	1948	11	5,160	21	.17
M b.m. pon.	1949	28	8,580	35	.28
pine, 1946)	1950	41	23,250	95	.77
	1951	41	15,020	61	.50
	1952	62	33,770	138	1.11
	1953	54	24,730	101	.82
	1954	43	27,510	112	.91
	1955	5	1,920	8	.06
Total		316	149,950	612	4.95
Average		32	14,990	61	0.50

(Continued)

Table 1.--Insect-caused losses (gross) on individual check plots in
old-growth ponderosa pine, Malheur National Forest and
adjacent timberlands, 1946-55--continued

Area and plot	Year	Trees killed	Volume loss		
			Total	Per acre	Proportion of 1946 green stand
		Number	-Board-feet-		Percent
JOHN DAY AREA					
Beech Creek	1946	26	19,560	62	0.84
T12S, R31E	1947	10	6,030	19	.26
Sec. 25N1/2	1948	11	4,550	15	.19
313a.	1949	14	5,970	19	.26
2.340 M b.m.	1950	17	8,640	28	.37
	1951	19	6,260	20	.27
	1952	31	11,560	37	.49
	1953	26	7,640	24	.33
	1954	28	16,580	53	.71
Total		182	86,790	277	3.72
Average		20	9,640	31	0.41
MALHEUR RIVER AREA					
Bridge Creek	1946	18	16,810	53	0.36
T17S, R32E	1947	19	7,570	24	.16
Sec. 36W1/2	1948	19	15,050	47	.32
320a.	1949	19	17,530	55	.38
4,650 M b.m.	1950	31	34,170	107	.74
	1951	20	13,680	43	.29
	1952	10	2,700	8	.06
Total		136	107,510	337	2.31
Average		19	15,360	48	0.33
Williams Ranch	1946	17	12,940	40	0.27
T20S, R32E	1947	24	7,340	23	.16
Sec. 20W1/2	1948	24	14,670	46	.31
320a.	1949	18	4,740	15	.10
4,726 M b.m.	1950	46	13,790	43	.29
	1951	20	14,440	45	.31
	1952	9	5,690	18	.12
	1953	15	4,040	13	.09
	1954	13	7,530	24	.16
	1955	25	13,230	41	.28
Total		211	98,410	308	2.09
Average		21	9,840	31	0.21

(Continued)

Table 1.--Insect-caused losses (gross) on individual check plots in
old-growth ponderosa pine, Malheur National Forest and
adjacent timberlands, 1946-55--continued

Area and plot	Year	Trees killed	Volume loss		
			Total	Per acre	Proportion of 1946 green stand
		Number	-Board-feet-		Percent
MALHEUR RIVER AREA					
Mahogany Spring					
T17S, R33-1/2E	1946	34	29,620	93	0.81
Sec. 28E1/2	1947	12	8,020	25	.22
320a.	1948	12	8,070	25	.22
3,645 M b.m.	1949	22	12,660	40	.35
	1950	26	17,100	53	.47
Total		106	75,470	236	2.07
Average		21	15,090	47	0.41
Summit Creek					
T17S, R35E	1946	13	15,470	48	0.36
Sec. 29E1/2	1947	7	8,880	28	.21
320a.	1948	12	16,300	51	.38
4,312 M b.m.	1949	11	8,220	26	.19
	1950	21	20,930	65	.49
	1951	8	5,930	18	.14
	1952	22	23,970	75	.55
	1953	15	18,160	57	.42
	1954	17	12,100	38	.28
	1955	18	16,510	52	.38
Total		144	146,470	458	3.40
Average		15	14,650	49	0.84
Crane Prairie					
T16S, R35E	1946	22	27,530	86	0.33
Sec. 10W1/2	1947	23	37,510	117	.45
320a.	1948	19	15,930	50	.19
8,270 M b.m.	1949	40	52,260	163	.63
	1950	40	43,490	136	.53
	1951	25	14,070	44	.17
	1952	35	42,170	132	.51
	1953	24	35,850	112	.43
	1954	37	31,050	97	.38
Total		265	299,860	137	3.62
Average		29	33,320	103	0.40

(Continued)

Table 1.--Insect-caused losses (gross) on individual check plots in old-growth ponderosa pine, Malheur National Forest and adjacent timberlands, 1946-55--continued

Area and plot	Year	Trees killed	Volume loss		
			Total	Per acre	Proportion of 1946 green stand
		Number	-Board-feet-		Percent
SNOW MOUNTAIN AREA					
Sawtooth	1946	57	28,010	88	0.57
T19S, R28E	1947	19	14,470	45	.29
Sec. 15E1/2	1948	19	13,810	43	.28
320a.	1949	23	14,320	45	.29
4,921 M b.m.	1950	48	29,270	91	.60
	1951	24	13,040	41	.27
	1952	51	32,090	100	.65
	1953	8	10,850	34	.22
	1954	31	9,130	29	.19
	1955	17	9,960	31	.20
Total		297	174,950	547	3.56
Average		30	17,500	55	0.36

Table 2.--Insect-caused losses (gross) for all check plots in
old-growth ponderosa pine, Malheur National Forest and
adjacent timberlands, 1946-55

	:	:	:	:	Volume loss							
	:	Check	:	:	:	:	Proportion					
	:	plots	:	Ponderosa	:	Trees	:	of 1946				
Year	:	cruised	:	pine sampled	:	killed	:	Total	:	Per acre	:	green stand
		No.	Acres		M b.m.	No.		---Bd.	ft.---		Pct.	
1946	9	2,798		38,803		221		172,700	62		0.45	
1947	9	2,798		38,803		138		101,400	36		.26	
1948	9	2,798		38,803		132		97,000	35		.25	
1949	9	2,798		38,803		231		154,100	55		.40	
1950	9	2,798		38,803		303		206,630	74		.53	
1951	8	2,478		35,158		193		101,300	41		.29	
1952	8	2,478		35,158		248		168,200	68		.48	
1953	7	2,158		30,508		158		108,520	50		.36	
1954	7	2,158		30,508		187		119,150	55		.39	
1955	4	1,205		16,991		65		41,620	35		.24	
Total	79	24,467		342,338		1,876		1,270,620	519		3.71	
Average per plot per year						23.7		16,084	52		0.37	

Table 3.--Spruce budworm infestation on and adjacent to the
Malheur National Forest, 1947-56

Year of Survey	Intensity of Damage				
	Light	Moderate	Heavy	Very heavy	Total
	Acres	Acres	Acres	Acres	Acres
1947	<u>1/</u> 41,000	0	0	0	41,000
1948	33,600	22,400	0	0	56,000
1949	0	127,900	0	0	127,900
1950	30,500	123,420	4,480	0	158,400
1951	117,440	24,960	0	0	142,400
1952	43,040	116,320	45,600	0	204,960
1953	80,560	70,230	49,440	0	200,230
1954	58,500	60,490	105,080	23,300	247,370
1955	49,110	15,620	0	0	<u>2/</u> 64,730
1956	209,520	19,460	0	0	228,980

1/ 1947 infestations were not separated by intensity of damage; however, most of the defoliation was presumed to be of light intensity.

2/ Infestations were mostly on the Aldrich Mt. unit, which was not sprayed in 1955.

Table 4.--Insect damage, by other than spruce budworm, on and adjacent to the
Malheur National Forest, 1952-56

Insect	1952		1953		1954		1955		1956		Total	
	:		:		:		:		:		:	
	Centers:	Area	Centers:	Area	Centers:	Area	Centers:	Area	Centers:	Area	Centers:	Area
	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>
Douglas-fir beetle	0	0	13	8,240	3	3,190	5	1,760	0	0	21	13,190
Mountain pine beetle	3	1,760	6	3,330	7	4,600	6	2,440	5	5,600	27	17,730
Oregon pine ips	22	6,720	20	1,470	2	980	4	1,060	36	13,120	84	23,350
Western pine beetle	7	11,040	54	68,670	40	38,190	11	11,420	3	960	115	130,280
Fir engraver	0	0	2	2,360	0	0	3	1,220	0	0	5	3,580
All insects	32	19,520	95	84,070	52	46,960	29	17,900	44	19,680	252	188,130